DATA HANDLING

•SIMULATION•

Systems Engineering

The development and application of digital simulation techniques to the study of information handling systems has been a significant part of the work of United Aircraft Corporate Systems Center. Effort has included statistical analysis in planning simulation trials, programming the simulations for running on large-scale digital computers, and the analysis of the output of the simulation models to determine system performance as measured by such factors as response times, information age and ability to maintain system schedules.

The availability of a variety of simulation languages, including the General Purpose Systems Simulator (Mark I and Mark II) and Simscript, has resulted in the concentrated application of these tools to study problems in diverse areas encompassing communications networks, personnel subsystems, and maintenance policies and procedures.

Computer simulation models have been used for tasks such as the analysis of a communications system for providing weather information to airborne pilots from forecasting facilities which also serve ground operations. The goal of this simulation was to determine a suitable balance between the following relevant evaluation criteria:

a. Probable delays in obtaining service.

b. Number of facilities (radio channels, ground channels, forecasters).

c. Loading on facilities.

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• SIMULATION •

Three model configurations were examined in the simulation trials:

Model A - Single air-to-ground radio channel and two ground-to-ground channels, serviced by one forecaster.

Model B - Single air-to-ground radio channel and two ground-to-ground channels, serviced by two forecasters.

Model C - Two air-to-ground radio channels and two ground-to-ground channels serviced by two forecasters.

Distributions of arrival rates of airborne aircraft contacts and ground contacts, and service times for airborne pilot-to-forecaster and ground-to-forecaster contacts were required as input data for the simulation trials. Statistical distributions were employed in all simulation trials, although the mean arrival rate for pilot and ground contacts was varied for four selected activity levels. A feature of the model was that air contacts had preemptive priority over ground contacts in securing a forecaster. Four simulation runs, each consisting of 1000 total contacts, were conducted for each of the three configurations.

Each simulation run provided the following information on system performance:

a. Distribution of delay times and query lengths.

b. Distribution of transaction times.

c. Utilization of communication channels.

For defined acceptable system performance criteria, this output data was used to select the configuration best meeting performance requirements. Analysis of the output data indicated that only one configuration, Model C, would meet preestablished performance criteria.

Such programs have provided the Center with a depth of experience in statistical analysis, programming, and evaluation for the application of simulation techniques to communications networks, personnel subsystems and maintenance procedures. The use of simulation permits system, subsystem and equipment design for command and control, production management, schedule reporting, etc., to be based upon evaluation of operational criteria.

UACSC will be pleased to discuss specific system problems and the utilization of UACSC capabilities for their solution.

For Additional Information, contact Mr. R. Shuart
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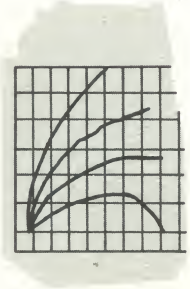

COMPIX **is a magnetic tape driven plotter having unique pictorial capabilities for image processing, tone shading and contour plotting.** ***COMPIX*** **produces fifty annotated 12 x 18 inch plots per hour regardless of complexity.**

United Aircraft Corporate Systems Center
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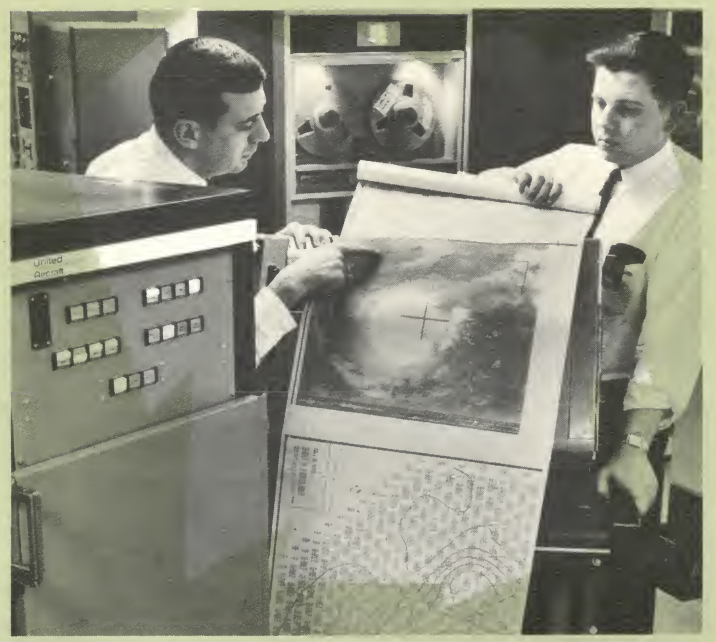
COMPIX



OPERATION of *COMPIX*, inculding the associated tape drive, is initiated by manual control. The taped information is processed so that the print unit creates marks on a scan line across the width of the recording head. As the paper passes through the print unit all information, i.e., lines, alpha-numerics, half-tones, is reproduced one scan line at a time at the continuous rate of 10 inches per minute. When a single product has been generated (after 11 inches for a B size drawing) the console is automatically turned off. In the "Auto" mode, printing will continue until all the taped data has been reproduced. Individual products may be printed or deleted by means of the console controls.

No setup time is required for scale or paper alignment regardless of number or size of products. Data on a single magnetic tape will produce a variety of products of any length at recorder width. When the transmission option is provided, all console functions remain operative, and automatically control the remote facsimile receivers. The products generated by remote receivers will be duplicates of the outputs generated by *COMPIX* console.

The console contains all the required circuitry for alphanumeric and graphic hard-copy presentation, including power supply, tape transport for off-line operation, input register, 18 inch plotting head, and self-test capability; and a computer program. The FORTRAN program permits preparation of cartesian coordinate plots with axes, grid, symbols and alphanumerics. Other programs are available, which include contour plotting, image processing, and use of polar coordinates. A simplified functional diagram of the *COMPIX* console is shown on the opposite page.

APPLICATIONS

1. PERIPHERAL COMPUTER ACCESSORY
   a. Printer/plotter
   b. Image (half-tone) presentation
   c. Operating monitor
2. DATA SYSTEMS — COMMUNICATION AND DISPLAY
   a. Production/inventory control
   b. Traffic monitor and control
   c. Weather systems
   d. Management information
   e. Automatic drafting
3. COMMAND AND CONTROL
   a. Fallout prediction
   b. Chemical/bacteriological contamination patterns
   c. Tactical operations, overlays and totes
   d. Logistics — statistical summaries
4. DIGITAL SYSTEMS DEVELOPMENT
   a. Simulation
   b. Equipment and technique check-out

In each of these applications *COMPIX* serves as a high speed printer/plotter with an exceptionally wide range of alphanumeric and graphic capabilities. In addition, *COMPIX* can be utilized as a real-time transmitter in a variety of communications and display networks. A number of optional features are available for specific uses.

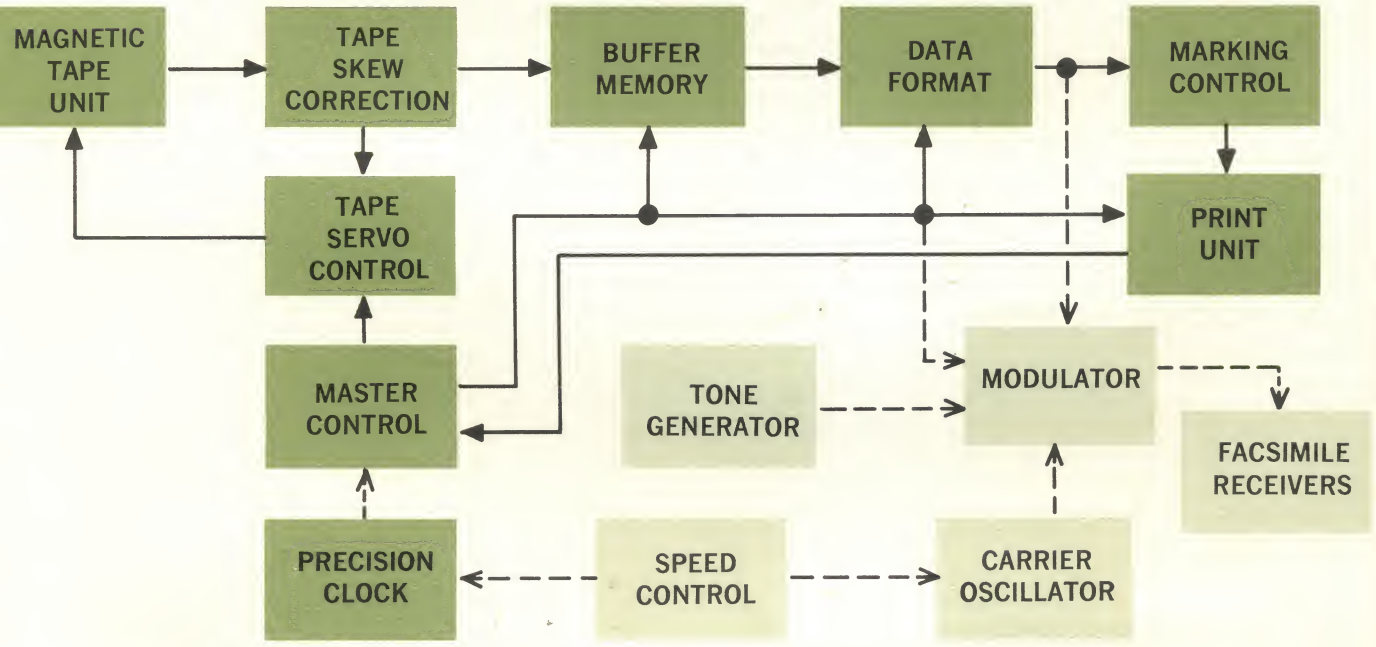
COMPIX is a high speed, magnetic tape driven plotting and printing device of great versatility. *COMPIX* converts digital computer data to contours, line plots, bar charts, engineering drawings, and tone shading for half-tone representation. Continous, dotted, and dashed lines of varying width provide multiple plot capability with no degradation in intelligibility. Alphanumerics for annotation and textual information are provided in any type font, in any size, and at any angle. Background information such as maps, forms, grid lines, can be merged with computer output data and selectively erased where conflicts exist between alphanumerics and the background. *COMPIX* will produce fifty B size drawings per hour regardless of complexity at 96 points per inch resolution in both the x and y axes.

FACSIMILE TRANSMISSION

A modular electronic chassis can be incorporated in the console to transmit COMPIX output to standard facsimile receivers at 120, 480, or 960 scans per minute via common carrier circuits and/or radio facsimile. The various speeds available permit efficient matching of time requirements with communication bandwidth costs. The chassis generates the precise signal timing required for facsimile transmission so that picture element positioning is controlled to one part in 10^6. Multiple remote facsimile receivers can be operated simultaneously through COMPIX transmission capability to produce duplicates of COMPIX output.

Additional COMPIX options are specified on the back cover.

FUNCTIONAL DIAGRAM



CONTROLS

FILE SEARCH | REWIND | START | STOP | AUTO / SINGLE | POWER | HI DENS / LO DENS

LOAD POINT | FWD / BKWD | TX 120 | TX 480 | TX 960 | TX ON / TX OFF

COMPIX

COMPIX

CHARACTERISTICS

Physical

Width — 30 inches
Depth — 30 inches
Height — 65 inches
Weight — 800 pounds
Environment — 60°F-100°F temperature
10%-80% humidity

Power

less than 1 kilowatt; 120 volts, 60 cycle

Speed

10 inches per minute
(independent of output complexity)

Tape Format

7 channel, IBM
556 or 800 BPI

Programs Available

Cartesian and Polar Coordinates, Shading (half-tone), Contours

Setup

None between plots, 150 foot roll stock

Copies

Output reproducible by Diazo and other positive copy techniques

OPTIONS

Transmission

Facsimile: 120, 480, 960 scans per minute via voice and Telpaks as required by speed

Recording Width

Various widths are available

On Line — Off Line

Without self-contained transport, *COMPIX* is compatible with IBM 729, system 360; CDC 603 and 606 tapes.

Background

Pre-recorded backgrounds for all programs.

For additional information
Phone or write . . .

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